DOCUMENT RESUME

ED 381 132 IR 017 054

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TITLE A Comparison of the Effect of Teacher-Directed Instruction (and Textbook Use) and Interactive Computer Software Instruction on the Development of Touch-Keyboarding Skills in Two Sixth-Grade Classes.
PUB DATE Apr 95
NOTE 54p.; Master's Thesis, Kean College, New Jersey.
PUB TYPE Dissertations/Theses - Masters Theses (042)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS Academic Achievement; Case Studies; Computer Assisted Instruction; Educational Technology; Elementary School Students; *Grade 6; *Instructional Effectiveness; Instructional Material Evaluation; Intermediate Grades; *Keyboarding (Data Entry); Middle Schools; Pretests Posttests; *Teaching Methods; Test Results; *Textbooks; Typewriting
IDENTIFIERS *Interactive Courseware; Middle School Students; Middletown Township School District NJ

ABSTRACT

This is a study of two sixth-grade classes at Bayshore Middle School (Middletown, New Jersey) who were enrolled in a 7-week keyboarding class. The first class met from October 31 through December 23, 1994; the second class met from January 3 through March 1, 1995. The instruction of the first group was teacher directed, and the students typed from a keyboarding textbook. After an introduction to keyboarding from the instructor, students in the second group received instruction from computer software (which was the same material as in the textbook). Both groups were pretested and posttested on their one-minute typing speeds measured in gross words per minute and on their knowledge of the location of the letters and punctuation in the first three rows of the keyboard. The hypothesis that students who are taught the touch method of keyboarding with teacher-directed instruction in conjunction with the use of a keyboarding textbook will not perform more effectively than students who are taught the touch method of keyboarding using an interactive computer software program proved to be correct. The students made similar measurable gains in their progress regardless of the method of instruction. A section of related literature on teaching keyboarding is included, and appendices provide test scores. (Contains 40 references.) (Author/AEF)

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A COMPARISON OF THE EFFECT OF TEACHER-DIRECTED INSTRUCTION (AND TEXTBOOK USE) AND INTERACTIVE COMPUTER SOFTWARE INSTRUCTION ON THE DEVELOPMENT OF TOUCH-KEYBOARDING SKILLS IN TWO SIXTH-GRADE CLASSES

by

Irene Russin

Accepted
3/27/95

A thesis
submitted in partial fulfillment
of the requirements for the Degree of
Master of Arts
Kean College of New Jersey
April, 1995

IR017054

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
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ABSTRACT

This was a study of two homogeneous classes of sixth-grade students at Bayshore Middle School in Middletown, New Jersey, who were enrolled in a seven-week keyboarding class. The first class met from October 31 through December 23, 1994; and the second class met from January 3 through March 1, 1995. The instruction of the first group was teacher directed, and the students typed from a keyboarding textbook. After an introduction to keyboarding from the instructor, the students in the second group received keyboarding instruction from computer software (which was the same material as in the textbook). Both groups were pretested and posttested on their one-minute typing speeds measured in gross words per minute and on their knowledge of the location of the letters and punctuation in the first three rows of the keyboard. The means, standard deviations and *ts* between all pre- and posttests were not significant. Thus, the hypothesis that sixth-grade students who are taught the touch method of keyboarding with teacher-directed instruction in conjunction with the use of a keyboarding textbook will not perform more effectively than sixth-grade students who are taught the touch method of keyboarding using an interactive computer software program proved to be correct. The students made similar measurable gains in their progress regardless of the method of instruction.

ACKNOWLEDGEMENT

I would like to thank Dr. Albert J. Mazurkiewicz (Chairperson of the Department of Communication Sciences at Kean College) for allowing me to perform this study and for his assistance in the statistics portion of this paper. I would also like to thank Mr. Robert Murphy, Principal of Bayshore Middle School, for permitting me to perform this experiment, and Dr. George Jarrach, Assistant Principal of Bayshore Middle School, for his support during my first year at this school. Accolades go out to Mrs. Jane Frye, the librarian at Middletown High School North, for her help in obtaining research materials, and to Mrs. Marge Norton, Reprographics and AVA Specialist at the high school. I am especially appreciative of the assistance given to me by Mrs. Jean Paterson, keyboarding and computer instructor at Bayshore, whom I consider to be a true professional in business education. I would also like to recognize Ms. Sharon Constantino, the sixth-grade guidance counselor at Bayshore; and Mrs. JoAnn Sherron, the co-author of the textbook and software program used in this study, for her encouragement and advice.

DEDICATION

I dedicate this paper to my husband, Jerry, who never once complained about my lack of attention to household responsibilities during my four years in the masters degree program and to all my keyboarding students, especially those who "did it (keyboarding) my way."

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The increasing use of computers in business, industry, government, education and in the home has made the efficient use of computers a basic skill. It is predicted that by 1995, 95 percent of what we want to know will be stored in computers (Wentling, 1992). Ms. Wentling points out that possessing touch keyboarding skills will speed up the operation of a computer--eight fingers will get data on the monitor faster than two fingers. Many schools and libraries have installed computer laboratories to be used for student writing. Students who can keyboard by touch are able to use computers more effectively for this purpose. This information should provide reason enough to conclude that it is important to form and develop correct keyboarding habits.

In a national survey of public school administrators, 62 percent agreed that the development of touch keyboarding operations is necessary for efficient operation of a computer for composition purposes and that the initial time invested in teaching a student to keyboard results in a time saving later on. (Condon, Hoggart, Weston, 1989). The New York State Department of Education (1986) maintains, "(Elementary school) students need to learn keyboarding skills to use computers for

composing text. To this end, drill and practice of appropriate fingering techniques is an essential step to develop proper use of the keyboard for composition."

Stewart and Jones (1983) note that keyboarding needs have now obviously expanded to include the elementary school and that many children have inadequate habits of operation by the time they reach junior high school typing classes. In a study of 116 students enrolled in three classes of keyboarding, the majority of students had adopted the habit of looking at the keys while typing prior to enrolling in the class (Davis and Little, 1984). They state that the

> ". . . extensive use of the computer without this (keyboarding) training develops bad habits which may become difficult or even impossible to break for those receiving keyboard instruction at a later time. People who use the hunt-and-peck method . . . develop their own style of inefficiency which becomes time-consuming and costly. This in turn, fosters feelings of anxiety, hostility and resistance to technology in general."

Sormunen, Adams, Berg, and Prigge (1989) conclude that effective keyboarding is an important foundation block upon which many other academic skills are built. They

state, ". . . action to address keyboarding skill development must be well planned and executed carefully and quickly because keyboarding is too important to be left to chance."

While researching the current trends in the teaching of keyboarding, the author was shocked and disheartened to read that some educators from the Graduate School of Education of the University of Pennsylvania actually **taught** the hunt-and-peck method, which they call "keyboard familiarization," **instructing** third- and fourth-grade children to use only the first finger on each hand! These researchers believe that teaching children how to touch-type "requires a considerable investment of time and effort" and that ". . . touch typing was developed for use by secretaries . . . ." (Kahn, Avicolli, Lodise, 1990). In another article, researchers from this school suggest that "at the elementary school level, children can learn to type **incidentally** while they learn to write." (J. Kahn and P. Freyd, 1990). They go on to suggest, without substantiation, that ". . . only twelve hours of formal touch typing instruction is probably sufficient to undo any bad habits . . ." Their feeling is that the values expressed by touch-typing advocates is discordant with whole language principles. Fortunately, the author found

no other evidence of this belief! Another elementary school educator stated that hard to break habits such as struggling with single fingers and looking at the keys when typing may stay with the child in the future. Additionally, she found that students using the hunt-and-peck method of keyboarding spend too much time at the keyboard and that frustration peaks as they lose their creative ideas while searching for the correct keys. (Binderup, 1988). She suggested a five-lesson method combining visual, tactile and oral instruction to introduce the touch-typing method to be followed by a computer keyboarding program. Balajthy (1988) concurs that the purpose of keyboarding instruction at the elementary level is to familiarize students with the keyboard layout and provide at least a **minimal** level of proficiency in touch typing. Buchanan (1993) found that students are ready for independent multi-paragraph word processing when they can type about twenty words per minute with 90 percent accuracy and a reasonably steady gaze at the screen. She noted that if students must repeatedly look up and down, their efficiency and motivation suffer.

Since school districts try to reduce costs, especially in the middle schools, regular classroom teachers are usually assigned the teaching of

keyboarding. According to Alexander and Dickey-Olson (1983), "an unknown number of teachers who are not certified to teach typewriting or keyboarding are presently using computer-assisted tutorial packages to teach these skills." In John Cantalupi's survey of K-8 instructors in Pennsylvania (1991), he found that 94 percent of non-business teachers and 60 percent of business teachers use computer software programs to teach keyboarding. Only 11 percent of non-business teachers use a textbook compared to 92 percent of business teachers. Additionally, only 28 percent of non-business teachers use teacher-made materials compared to 40 percent of business teachers. While Sunkel and Cooper (1983) contend that using computer-assisted tutorial packages makes learning a skill easy and pleasurable, this author believes that many teachers may use these programs because they involve the least amount of exertion on their part.

Many interactive computer software programs have been created based on the psychology of psychomotor skill building and provide for individual differences in rate of learning, and they are excellent for individual learning. (Some programs are not very good, so it is also important to evaluate or get an evaluation of the program before it is adopted for classroom use.) Frankeberger

(1990) believes that the decision to use software to present the basic keyboard to the students should be carefully evaluated. The author of this thesis feels that the maturity of students to discipline themselves to use computer generated instruction **correctly** must be taken into account, also.

For many students, middle school keyboarding is the only formal keyboarding class they will have, so it is especially important that they learn the correct techniques and/or try to correct their incorrect techniques. Cantalupi (1991) states that a review of the literature failed to reveal any studies conducted to determine the effectiveness of the computer-assisted method of teaching keyboarding versus the teacher-directed method. Therefore, the author believes it would prove useful to evaluate the effectiveness of keyboarding instruction with interactive computer software programs as compared to teacher-directed instruction for sixth-grade middle school students, which is the purpose of this study.

Hypothesis

It is hypothesized that sixth-grade students who are taught the touch method of keyboarding with teacher-directed instruction in conjunction with the use of a keyboarding textbook will not perform more effectively

than sixth-grade students who are taught the touch method of keyboarding using an interactive computer software program.

Procedures and Sample

Two classes of sixth-grade students at Bayshore Middle School in Middletown, New Jersey, participated in this study. Each class was heterogenous. The first group consisted of 18 students, 10 boys and 8 girls. Three students were in high-level academic subjects; seven, in middle-level; and eight in low-level (including four classified students). The second group consisted of 19 students, 10 boys and 9 girls. Four students were in high-level academic subjects (including one gifted and talented student); four, in middle-level; and 11 in low-level (including six classified students).

Sixth-grade students participate in five activity cycles throughout the year, and each cycle lasts seven weeks. The first group in this study was the Cycle 2 keyboarding class, which began on October 31, 1994 and concluded on December 23, 1994. The second group was the Cycle 3 keyboarding class, which began on January 3, 1995 and concluded on March 1, 1995. Each class met five days a week, approximately 35 times; however, the experimental part of each class concluded when the students completed 20 lessons (covering the alphabet and punctuation keys of

the first three rows of the computer keyboard) and their post-tests. Both classes met in the same room with the same teacher and used Macintosh computers.

On the first day of instruction for both groups, a pretest was distributed consisting of a keyboard chart in which all the letters and punctuation marks in the first three rows were blank except for the letters f and j. The students, most of whom professed to know the keyboard, were instructed to fill in the letters and punctuation marks of the keys. The students also completed a questionnaire in which they were asked to write their names, elementary school attended, grade(s) in which keyboarding was presented or learned; duration of keyboarding instruction; whether they had had any keyboarding instruction outside of school and if so, what kind. They were also asked to check the method of keyboarding they were using currently and whether it was easier for them to write or key a report.

Student folders and a keyboard chart with all the letters and punctuation marks filled in were then distributed. In addition, each chart and the fingers of pictures of the left and right hands were colored to show the students which rows of keys were keyed with which fingers; e.g., the "green" rows of keys were to be keyed with the "green" fingers of each hand. I also explained

why the home row was called the home row and why at least one finger of each hand should be on or near a home-row key at all times. I explained that one key on the left and right sides of the home row will have raised dots or bars on them so that visually impaired people will know they are on the right keys. By using this method of keying, it is possible to key by touch, without looking at the keyboard.

Student papers with corrections were returned the next day and students were told to review them so that they could see which keys they did not know. The students were assigned computers and, after instruction on how to access the computer, began lesson 1. During the second and third classes, the students were called over to a computer, one at a time. The instructor keyed a line to demonstrate the touch method, and the students were then asked to key from the same paragraph for one minute using any method with which they were comfortable. They were told that the instructor wanted to see at what speed they were starting so that she could see how much they improved after they had completed 20 lessons.

Instruction in the first group was directed by the researcher, and the students typed from the textbook, EMC Keyboarding and Applications by Jo Ann E. Sherron, Ed.D. and Ronald H. Sherron, Ph.D. (EMC Publishing, St. Paul,

MN, 1993). They were taught how to access the ClarisWorks word processing program to key their lessons. They printed their work as soon as they completed each lesson or as much as they completed by the end of the period.

The second group was taught the touch keyboarding method using the EMC Keyboarding student-interactive software which correlates to the textbook but appears on the computer screen. The students did not print any of their lessons.

The instructional emphasis in learning to keyboard--technique, speed and accuracy in that order--was the same in both groups. The students proceeded at their own rates after teacher direction or using the computer software, but all students worked on the same lesson each day, unless a student had been absent. If a student had been absent in the first group, he or she participated in the class instruction and drill and then, after individual instruction, keyed the lesson he or she had missed. In the second group, the student chose the next lesson. In both groups, students who completed their lessons had the choices of repeating all or part of a lesson; completing assignments from "The Galaxy Gazette," a word processing assignment; keying material of their own--a letter to a friend, homework, etc.; creating

something using the Print Shop software; or playing a computer game as time permitted. Because some students never had time to do any of the "fun" options, occasionally, depending on their behavior, the classes were granted a "free day" to do what they wished.

In the first group, correct posture, hand and finger position and stroking technique for each letter and manipulative part of the computer keyboard was demonstrated and instruction provided. Location drills for each lesson were dictated, then words, and finally the first line in the textbook for each new key to pace the students for speedy automatization of each reach. Mnemonic associations were offered to help the students to remember which fingers key which letters, e.g., s-x: think sex; f-r: think french fries; f-v: five; f-r-f-v: five french fries; s-w: sweet or swatch watch; k-i: kick; k-,: both keys begin with the same k sound; c-d-e: alphabetical order and same finger; j-u: juice; j-n and j-m: Jay's girlfriends, Nancy and Mary; j-y: Jay, of course; l-o: low; l-.: the dot (.) goes in the o; etc. The students were encouraged to recite these associations as they keyed; e.g. "s-w-s, space, swatch watch; s-w-s-space, swatch watch," etc. Students were given one-minute timed writings every few days at their computers so that they could see how much they were improving. We

would also key parts of the alphabet: "acdefg" (b wasn't presented until a later lesson) with the left hand; then "hijklmno" with the right hand; "rst," left hand. Of course, by lesson 20, we could key the whole alphabet.

In the second group, the students learned from the computer software, which briefed them on the instructional objective for each lesson and provided them with personalized goals and feedback on their performance. In the section of each lesson where new keys are presented, a reinforcement feature is included: if the student presses an incorrect key, the correct key flashes, and students must press the correct key to proceed. In a skill exploration section of each lesson, students race against the computer at various speeds. Students also take timed-writings in the mission assessment part of some lessons on the computer, which scores their speeds after the students finish three lines of typing. (This is the only portion of the software in which lines to be keyed are to be copied from the textbook. Occasionally, however, when a student inadvertently pressed the escape key which ends the lesson, he/she was told to choose "open screen" from the EMC menu and complete the lesson from the book, rather than have him/her start the lesson all over again from the computer program.)

Students in both groups were given individual feedback, encouragement and assistance. However, some students in the first group were given individual instruction and demonstration at their computers; whereas, instruction for students in the second group was confined to suggestions or remarks such as "Use the left hand for the left side of the keyboard and the right hand for the right side;" "Use two hands!;" "You are not a chicken--no pecking!;" "Sit up in your chair;" etc. In addition, papers were graded each day for students in the first group: they received a grade of 100 percent if the lesson was completed; if the lesson was not completed, 100 was divided by the number of lines to be keyed, and that number was deducted from 100 for each line not done. Points were also deducted if spacing rules for punctuation marks were not followed or if students did not use capitals where required. Otherwise no points were deducted for errors; students were instructed to key at a rate that was comfortable for them without worrying about making errors. I explained to both groups that it was normal to make several errors per line when first learning a new key or keys and that the number of errors would decrease.

During each cycle, each student's technique was observed and evaluated using the technique check sheet provided in the teacher's edition of the textbook.

Results: Analysis of Data

The gross words per minute speeds achieved on one-minute timed-writing pretests by the teacher-directed group ranged from six to eighteen words per minute; on the posttests, their speeds ranged from nine to twenty-seven words a minute.

For the group receiving computer-assisted instruction, their pretest speeds ranged from seven to twenty-two words per minute; on the posttests, their speeds were exactly the same as in the first group--nine to twenty-seven words a minute.

Appendix A lists the pre- and posttest speeds for each student in both groups. It is interesting to examine the individual differences in the number of words increased by the students, which ranged from one to thirteen words per minute.

As can be seen in Table I, the difference between the pretests of the two groups was not significant as shown by the *t* statistic.

TABLE I

Mean, Standard Deviation and *t* Between Pretests

	Mean	Standard Deviation	*t*
Teacher Directed	11.44	2.97	-.67
Computer Assisted	12.16	3.38	

ns

Table II indicates the data at the conclusion of

TABLE II

Mean, Standard Deviation and *t* Between Posttests

	Mean	Standard Deviation	*t*
Teacher Directed	17.61	4.64	-.22
Computer Assisted	17.94	4.30	

ns

the study, and there was a .37 difference between the samples which is not significant.

It can be seen in an examination of data in Tables I and II, that although the teacher-directed group started out behind the other sample, it made a larger gain in speed than the group using computer software.

The scores on the pretests given to the teacher-directed group where the students filled in the letters

and punctuation marks for the keys on the first three rows of the keyboard chart ranged from 0 to 77 percent; on the posttests, their scores ranged from 40 to 100 percent.

For the group receiving computer-assisted instruction, their pretest scores ranged from 17 to 63 percent; on the posttests, their scores ranged from 54 to 100 percent.

Appendix B lists the pre- and posttest scores for each student in both samples.

Tables III and IV show the results of these pre- and

TABLE III

Mean, Standard Deviation and *t* Between Pretests

	Mean	Standard Deviation	*t*
Teacher Directed	36.00	25.48	-.06
Computer Assisted	36.47	14.93	

ns

posttests. At the outset, the samples' achievement were almost identical with a means difference of only .47. Table IV, however, shows that the teacher-directed group produced a mean score of 83.56 percent, whereas the

TABLE IV

Mean, Standard Deviation and *t* Between Posttests

	Mean	Standard Deviation	*t*
Teacher Directed	83.56	26.39	1.19
Computer Assisted	74.42	25.24	

ns

computer-assisted group produced a mean score of 74.42 percent. Although the mean of the teacher-directed group was 9.14 percentage points higher than the mean of the group using computer software, the size of the gain was not significant.

Conclusion

The hypothesis that sixth-grade students who are taught the touch method of keyboarding with teacher-directed instruction in conjunction with the use of a keyboarding textbook will not perform more effectively than sixth-grade students who are taught the touch method of keyboarding using an interactive computer software program proved to be correct and the hypothesis was accepted. The students made similar measurable gains in their progress regardless of the method of instruction.

Discussion and Implications

Using *t* tests, the analysis revealed no statistically significant differences between the control and experimental groups. Yet, many good things were achieved in **both** groups that were not measurable.

The students in the teacher-directed group appeared to have an easier time learning and remembering the location of the letters and symbols on the keyboard. Perhaps that accounts for the larger gain in speed the group made as compared to the group using computer software. From informal observations of both groups, it appeared that the majority of the students in the teacher-directed group knew the exact location of the keys, whereas many students in the group using computer software were still "hunting" for many of the keys, especially the keys in the bottom row, at the end of the twenty lessons. While it cannot be claimed that the majority of either group developed the correct touch typing technique, it appeared that even though most of the students in both groups were still "peckers" at the conclusion of twenty lessons, there were fewer "hunters" in the teacher-directed group than in the computer-assisted group. This can be attributed to the mnemonic associations and verbal repetitions of relationships between keys made by both teacher and students and to the

frequent keying of parts of and eventually all of the alphabet; however, no concrete proof of this can be offered.

Regretfully, it must be reported that no student was able to key without looking at his/her fingers at the end of the twenty lessons in either group. However, by the end of each study, five students in the teacher taught sample and four students in the computer software instructed sample were keyboarding using the touch type method of fingering. Several others made some improvement in technique. Two students (one in each group) started out using only one finger to keyboard; now they use two--one finger of each hand. Several starting out with the "two-finger" method now use four or six fingers. However, most students do not keep their fingers on or near the homerow keys; and several students even "cross over" from the right-hand side of the keyboard to the left-hand side. These observations parallel those of Mikkelsen and Gerlach (1988) that although computer software can provide keyboarding instruction through a series of developmental lessons and offer correct modeling techniques, the use of a typing tutorial does not insure proper keystroking technique. The results of this study also support Kimball and Lane's (1989) observation that it is extremely difficult for an

individual to learn the touch method of typing if he has already learned bad habits.

The students who did alter their habits were more motivated to do so than the others. One had a mother who could type 100 words a minute; others may have believed, after watching the teacher keyboard, that if the teacher could do it (touch-type), so could they; still others were motivated by how the teacher would evaluate their hand and finger position and stroking technique on their technique check sheet. (They were informed at the start of each cycle that no one would get a grade of "A" unless he/she used all eight fingers correctly.) As Carolee Sormunen (1993) pointed out, our students' disposition and willingness to use their abilities play a part in the learning process. Perhaps these students possessed the "persistence" factor which Sormunen correlated with keyboarding achievement in her study.

A student questionnaire was filled out by each student. Three-quarters of the students in each group reported that they received some keyboarding instruction in the first grade, and all had keyboarding instruction by the fifth grade. In the teacher-directed group, only one student reported receiving keyboarding instruction outside of school, by a parent. In the computer-assisted group, ten students had received instruction, and several

reported using Mavis Beacon and Typing Tutor software at home. Seven students in the first group used computers to key reports for school at home; ten did so in the second group. Thus, the students were not beginning their seven-week keyboarding course with a "clean slate"; they already possessed their own keyboarding style or method. It can be reported that no one used the touch typing technique at the start of this course.

The researcher's observations compel her to agree with Jackson and Berg (1986) that **formal development** of correct keyboarding technique should be introduced in the third grade before students adopt bad habits. The researcher also agrees with Sormunen, et als. (1990) that colleges and universities should offer special methods courses in keyboarding instruction for prospective elementary school teachers and that formal plans for grade-by-grade keyboarding applications in elementary school need to be developed to provide for continuous keyboarding skill development and use of the touch system. Perhaps business and elementary school teachers could work together through workshops and inservice programs as the authors recommend.

With regard to the use of computer assisted instruction, observations of students in both groups lead the researcher to concur with the views of several other

researchers that it is easier for the students to key from the screen than from a textbook. This is especially true in the classroom used for this study where the desks are too high for the students to reach comfortably and where no bookstands are available. However, as pointed out by the Connecticut State Department of Education (1984), students using computer assisted instruction can waste practice on timed sentences by striking any jumble of keys just to complete the section of the lesson. In the software the students used in this study, it was possible to do this for some of the practice lines also.

The students enjoyed using the computer software; however, the students using the textbook were motivated by the fact that their lessons would be printed out at the end of each class session and would be graded based on how much they had accomplished and whether they participated in class drills and timings! Of course, not all students were motivated equally.

In summary, computer-assisted instruction can successfully be used to instruct students in the touch typing method of keyboarding and to develop their skills. However, the evidence in the study leads me to concur with Schultz (1985), Balajthy (1988), Jackson and Berg (1886) and other researchers that teachers should provide personal contact, instruction, encouragement, and

constant monitoring of their students in conjunction with the use of software. At this point, the researcher is inclined to agree with JoAnn Sherron, the author of EMC Keyboarding and Applications (1993), the textbook and software used in this study, that a combination of textbook and software be used to teach keyboarding.

I would suggest that there should be a replication of this study, and possibly, a third group could be included in which this combination approach would be used.

METHODS OF TEACHING KEYBOARDING: RELATED LITERATURE

The traditional or structured method of instruction in keyboarding has been the teacher-directed approach, which involves the teacher guiding the learning and pacing of the students through drills (Robinson, 1985). In the last fifteen years or so, as the prices of computers dramatically decreased and their use dramatically increased, many computer software tutorials have been developed to teach keyboarding. This method of instruction using a software program is referred to as computer-assisted instruction.

Balajthy (1987, 1988) considers computer based instruction particularly suited to the highly structured experiences required for introductory keyboarding instruction. He believes that the motivation of computer based game-like drills can be useful for maintaining student interest. However, he points out that effective computer-based packages for keyboarding instruction should include explicit instructions on finger placement and provide well-sequenced practice under nonstressful conditions. He also stresses that effective keyboarding instruction requires close monitoring and motivation by a knowledgeable instructor and that student use of the computer without touch-typing skills can lead to the

development of bad habits that are hard to break. Robinson (1985) concurs and states that it is extremely difficult for an individual to learn the touch method of typing if he has already learned bad habits. Jackson and Berg (1986) state that using a computer without properly learning keyboarding skills will definitely hinder students' future development. It is interesting to note that all these pronouncements by experts do not thwart admitted non-experts from recommending teaching "keyboard familiarization" as an alternative to touch-keyboarding (Kahn, et al., 1990).

In a survey of the practices and perceptions of K-8 keyboarding instructors in Pennsylvania public schools, 93.8% of non-business education certified respondents (79.4% of total respondents) reported using computer software programs to assist in keyboarding instruction (Cantalupi, 1991). In a national survey of elementary and junior high/middle school keyboarding instructors conducted by Kimball and Lane (1989), 42% of all respondents used computer software packages. In a random sample of 300 elementary schools including grades K through 6, 74.4% of the respondents reported using software. It was discouraging to read that more than 25% of the teachers reported that they provided little

monitoring of the practice sessions. (Sormunen, et. al., 1990.)

It is distressing to note that only 3.1 percent of the teachers who taught keyboarding were business majors. The college majors of the other keyboarding instructors in Sormunen's study included special education, art, physics, music, natural sciences, French, biology, Latin, social studies, English, mathematics, library science, administration and counseling. I hope they do not believe that sitting their charges in front of a computer with a computer software package absolves them of their responsibility to ensure that their students learn to use the keyboard correctly.

The most frequently mentioned software packages in the survey by Kimball and Lane include Minnesota Educational Computer Consortium (MECC), Microtype: The Wonderful world of PAWS, Typing Tutor, Type to Learn, Master Type and Mavis Beacon. Respondents in Sormunen's study used Bank Street Writer, Microzine, Sticky Bear Typing, Magic Slate and Kids on Keys in addition to those mentioned in the Kimball and Lane survey. Jackson and Berg (1986) recommend MECC Keyboarding Primer, Alphabetic Keyboarding, Superkey, and Computer Keyboarding, An Elementary Course, in addition to the aforementioned programs.

Robinson (1985) emphasizes that a student's initial exposure to keyboarding should be one that lays the proper foundation upon which further skill may be built. Lynda Frankeberger (1990) observed that software keyboarding instruction tends to measure short-term speed goals rather than the correct techniques to achieve long-term speed development.

McLean (1987) projected correctly that much instruction would be computer-aided in the elementary schools since teachers have generally not been prepared to teach keyboarding. Therefore, he cautioned that teachers need to be assisted in selecting appropriate software. He pointed out that much of the software that purports to teach keyboarding does not succeed and many of the popular, best-selling software packages do not even teach the keyboard; and those that do violate many of the principles of how keyboarding is learned. Many of them are simply computer games without learning outcomes. A study by the New York State Education Department (1986) cautions that because games focus on speed rather than on technique, they tend to enforce "hunt and peck" methods. The authors of the study find these "game" programs appropriate only for drill, remediation or enrichment.

The author found three studies involving the use of computer-assisted instruction in the elementary grades

but no study which compared teacher-directed instruction and interactive computer software instruction.

Since many educators are led to believe and do believe that computer software packages which demonstrate correct techniques and provide practice in keyboarding through developmental lessons are sufficient to ensure that students develop skill in keyboarding with a minimum of teacher intervention, Mikkelsen and Gerlach conducted a study to see if this could be validated. Their aim was to determine if a typing tutorial enables students to build skills without the teacher providing direct instruction. They divided 56 students into two groups--third and fourth grades, and fifth and sixth grades. Both groups used the Microtype computer tutorial to learn keyboarding skills; however one group was supervised and one was not. In the supervised group, students were monitored for proper keystroking technique; in the unsupervised group, assistants answered questions but offered no suggestions about proper techniques. When their pre- and post-tests were compared after 14 lessons, both groups made similar progress regardless of environments, grade level, gender or prior experience with typing. No difference was found between the two groups in terms of whether they placed their hands on the home keys or where they focused their visual attention

(on the keyboard, text or monitor). An increase in words typed per minute occurred in all grade levels in both environments except the sixth grade students, who experienced a slight decline. However, these students had already achieved a mean of more than 15 words per minute prior to using the tutorial. The researchers concluded that while computer software can provide keyboarding instruction, the use of a typing tutorial does not insure proper keystroking techniques, even when students are monitored closely.

Neuman and Morocco (1987) observed 14 learning disabled students in resource rooms as they began to work with computers in writing. One teacher used a daily drill and practice approach to teach keyboarding skills; one teacher used computer typing games occasionally; a third teacher provided no keyboarding practice at all--her students spent all their time on writing activities using the computer. By the end of the year, the researchers determined that the students who received even short periods of instruction in approaches one or two were more at ease at the computer and could write for more sustained periods than those who received no instruction at all. Many of the children who did not receive any instruction were still struggling at the computer even after six months of continuous work in

writing. The researchers' observations also indicated that a typing program which required students to transcribe from paper to the keyboard was confusing to them, since learning disabled children often have difficulty dividing their attention between various stimuli. They conclude that keyboarding instruction is most effective when it provides instruction directly on the monitor (computer-assisted instruction), thus eliminating the need for the child's eyes to move from one point to another. They emphasize that teachers need to carefully monitor keyboarding practice to ensure that students practice with their hands on the home row. They also observed that students' concern for accuracy frequently encouraged them to use any method they could to press the correct keys.

Two hundred seventh grade students participated in a pilot program conducted by the Connecticut State Department of Education (1984) in which they used the computer software program, Microcomputer Keyboarding, to learn keyboarding. The class size was in the 10-12 range, and students attended the class for two periods a week for 18 weeks. However, the teachers in these classes acted as the "manager" of learning--not the source of instruction. As students worked, their progress was checked and corrected daily. Students

reported their speeds daily; teachers could check their screens if they desired. Pre- and post-tests were used to determine achievement. At the end of the classes, all (educational) levels showed improvement in speeds ranging from 9 to 25 words per minute, and most students exhibited the ability to keyboard without constantly looking at their fingers. The study states that the proper fingering was used for all class work (although based on my experience, I find this difficult to believe). As a result of this program, the curriculum was adopted for use in grades six and eight as well.

Although this program was deemed successful, the following disadvantages were cited in the above study: Student work must be constantly monitored to make sure that no one skips a part of a lesson or races through a section to avoid more practice. Students can waste practice on timed sentences and paragraphs by striking any jumble of keys. Also, the researchers found that students do not always understand third or first finger. The teacher must reemphasize which finger to use. Most students need to be monitored to ensure that they continue to use proper fingering.

Studies were conducted involving older teenagers and adults learning touch-keyboarding by using computer-

assisted instruction in both school and business environments.

W. P. McGhee (1992) studied four 18-year-old female students in a secondary school special program for students who demonstrated moderate to severe dysfunction in a regular classroom setting or who had previously dropped out of school. One student had had no prior keyboarding instruction; the others had been enrolled in prior keyboarding classes with different degrees of success. The computer program, Typing Tutor IV, was chosen. After 50 thirty-minute sessions, three of the students demonstrated close to a doubling of performance levels; the student who already typed 27 words a minute improved six words more. On the basis of this data, one may conclude that the use of this computer-based keyboarding tutorial did improve skill development in keyboarding.

Ownby and Perrault (1983) designed an independent, partially individualized, experimental keyboarding course at Oklahoma State University, using the computer software, Microcomputer Keyboarding, to be used on the computer, and a text accompanied by audiocassettes, Basic Keyboarding Skills, to be used at the typewriter. The students completed a lesson on the computer and then completed the same lesson on the typewriter. All lessons

were completed on an individual basis; students signed in and out for each lesson and placed completed typed lessons in folders. They were tested weekly; however. The students received no class or individual instruction other than an introductory meeting. After 25 hours of instruction/practice. a panel of three typewriting instructors rated the keyboarders' technique. Although they found the level of technique development less than desirable, a comparison of (words per minute) scores showed little difference between these keyboarding students who had almost no teacher interaction and the basic typewriting students in a teacher-directed environment. The researchers concluded that students can learn by media, but many continue to need instructor interaction for reinforcement and guidance.

A research report on eight students enrolled in keyboarding at State Fair Community College in Sedalia, Missouri, indicated that computer-assisted instruction, Microcomputer Keyboarding, provided adequate instruction for proper position at the keyboard, fingering, and speed and accuracy drills. Four of the students were given instructor checkpoints at specified intervals (individual attention, motivation, instruction); the other four had no interaction with the instructor. Conclusions drawn from the students' evaluations indicated that while they

felt the computers provided adequate instruction, they liked the contact with the instructor, especially receiving praise. As a result of this experiment, the researcher recommends that computer-assisted instruction be used in conjunction with personal contact with the instructor. (Schulz, 1985.)

When the John Hancock Property and Casualty in Boston converted to an automated claims system in 1991, employees were quite slow in entering data and made many errors. The company installed a computer program to teach the correct keying skills in a half-hour a day. However, little or no improvement was seen until management demonstrated some control over and support of their progress. They gave awards and certificates to serve as incentives for employees to improve their accuracy and speed, and they shared weekly reports showing the money John Hancock saved as a result of the employees' improvement in skills. As a result of using the computer program combined with management support, employees were able to absorb an increased workload and error rate plummeted by 70 percent. (Riendeau, 1994.) This report demonstrates that even adults appreciate direction, supervision and encouragement from a "superior" (in this case a manager as opposed to a teacher) while learning a new skill.

Other factors may influence or contribute to the effectiveness or lack of effectiveness of instruction in keyboarding. The ages and maturity of the students is one factor: older students are more motivated and disciplined to perform as directed using computer-assisted software, perhaps because they understand the value of typing by touch rather than by "hunting and pecking." However, the studies above indicate that even the adults appreciated interaction with teachers/management.

Keyboarding is a psychomotor skill involving kinesthesis, and according to West (1983), kinesthetic sensitivity, like visual and auditory acuity, exists in different amounts in different people. West observes that those students who use their natural kinesthetic ability earlier are more likely to become better typists.

Carolee Sormunen (1993) administered the Dunn, Dunn, and Price Learning Style Inventory (LSI) to 48 fourth grade students in an elementary school, as well as pre- and post-tests to measure speed achievement in keyboarding. The keyboard was presented in 20-minute daily sessions; then students worked with the computer 30 minutes daily in various language arts/word processing activities. At the end of the year, she found that the only significant factor of the 22 factors of the LSI was

persistence. She concluded that learning is an interactive process that involves the student, teacher and environment; and even when the student and teacher are working hard at the process, learning does not always occur. The students' dispositions and their willingness to use their abilities must be considered.

Shultz (1985) concurs with West and Sormunen and noted in her study that the outcome of instruction cannot be measured precisely because the variables of previous experience in typing, personal motivation and kinesthetic ability must be considered.

Schmidt (1983) noted the following advantages of teaching keyboarding with microcomputers: immediate feedback for students, lack of embarrassment when mistakes are made, lack of subjective teacher evaluation, flexible scheduling, and freeing the teacher from time-consuming tasks.

Robinson (1985) observed that computers have limitations: they cannot see, so they cannot monitor student work; they cannot hear, so they cannot answer questions. He emphasized that a knowledgeable, well-trained teacher must supply the missing ingredients. Regardless of the method of instruction, he recommended that the following elements prevail in keyboarding instruction: modeling, reinforcement, individualized

goal setting, pacing, differentiated practice, and evaluation.

Prigge and Braathen (1993) point out that the high energy levels and short attention span of children in grades four through six, make it difficult for them to sit still for extended periods. Therefore, they advocate that a variety of teaching methods be used.

Jackson and Berg (1986) believe that a combination of computer-aided instruction and a keyboarding textbook, which has coordinated lessons, provide the most desirable instructional media. They stress that students must be monitored constantly and given immediate, appropriate feedback regarding what they are doing right and wrong. Students must be encouraged to make corrected adjustments immediately. In a telephone conversation with JoAnne Sherron, a co-author of the EMC Keyboarding textbook and software package I used for this study, she, too, recommended using a combination of teacher-directed instruction (using the textbook) and computer-assisted instruction (using the software).

I believe that Frankeberger (1990) offers the best advice for keyboarding teachers: Keep the best of the old but don't be afraid to try new methods. She projects that it will be years before a formula for success is

tested, proved and published; and she recommends that each teacher become a researcher.

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APPENDICES

APPENDIX A

Pre- and Posttest Raw Scores on 1-Minute Timings in Gross Words Per Minute

Cycle 2: Teacher-Directed			Cycle 3: Computer Assisted		
Student	Pretest	Posttest	Student	Pretest	Posttest
1.	12	22	1.	12	15
2.	9	12	2.	12	17
3.	15	16	3.	12	17
4.	10	14	4.	7	18
5.	12	20	5.	12	21
6.	13	22	6.	11	14
7.	11	17	7.	14	27
8.	14	20	8.	12	21
9.	14	24	9.	13	20
10.	18	27	10.	10	12
11.	12	21	11.	10	15
12.	7	14	12.	11	17
13.	11	15	13.	17	21
14.	8	14	14.	15	19
15.	6	9	15.	9	18
16.	9	14	16.	8	9
17.	12	16	17.	10	17
18.	13	20	18.	22	26
			19.	14	17

APPENDIX B

Pre- and Posttest Raw Scores on Test in Location of Keys on Keyboard Chart Based on Percent

Cycle 2: Teacher-Directed			Cycle 3: Computer Assisted		
Student	Pretest	Posttest	Student	Pretest	Posttest
1.	59	100	1.	53	54
2.	43	97	2.	46	64
3.	0	79	3.	46	83
4.	20	90	4.	36	90
5.	30	100	5.	46	54
6.	30	100	6.	33	59
7.	43	97	7.	63	100
8.	46	50	8.	53	100
9.	69	90	9.	23	77
10.	3	92	10.	30	67
11.	3	46	11.	36	70
12.	77	100	12.	17	100
13.	46	80	13.	63	100
14.	20	40	14.	36	60
15.	3	59	15.	40	77
16.	43	97	16.	26	60
17.	83	97	*17.	--	64
18.	13	20	18.	26	100
			19.	30	100

*This student was absent for the first two weeks of the course and her pretest was misplaced. Therefore, her posttest score was not counted in the analysis of the data for this test.